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The invention relates to a radiator with modular build upable cool construction units, like cooling agent pipes, between the cooling agent pipes arranged louvres and the cooling agent pipes at their ends of interconnecting with one another elements.

Generally z become cooler the cool one of fluids. B. Cooling water, engine or transmission oils, air, z. B. Load air, refrigerants etc. and as stationary or mobile units used. Such radiators usually exhibit two each other opposite Wasserkästen, in whose tubesheets openings are provided, into which the ends of the cooling agent pipes are pushed in. Between the cooling agent pipes are the cool lamellas, z. B. Waving ribs, discharged over which the warm one becomes to the depressing air. Such radiators usually consist of several materials, z. B. Aluminium for the cooling agent pipes and the louvres and plastic for the Wasserkästen. Perhaps the radiators exhibit still federation metal leads or other elements. In any case one possesses a such radiator a predetermined structure, by z. B. the openings in the tubesheet usually regular and at predetermined positions provided are. Such radiators are optimized for certain applications in their performance and/or. on certain installation conditions tuned.

The invention is the basis the object, a radiator will make available, which is constructed to from a small number of various components, to the other relative rapid both to a changed achievement profile and to another building area adapted can.

This object becomes according to invention with a radiator that initially mentioned type by the fact dissolved that the cooling agent pipes are formed as flat tubes, and that those are the flat tubes of interconnecting with one another elements as discs formed, which exhibit at least the height of a louvre and on the flat tubes finallaterally mount and/or into which the flat tubes are pushed in, whereby the discs exhibit an opening and over the opening with the interior of the flat tubes connected are.

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The radiator according to invention possesses a small number of different components, i.e. only flat tubes, on the flat tubes mounting discs and between the discs arranged, likewise louvres mounting on the flat tubes. The discs and the louvres in a plane exhibit the same height, and in the next plane the height of the discs can and/or. Louvres large or small its. In this way constructed can become after type of a component system of the radiators in accordance with the performance requirements, whereby the dimensions of the radiator on the number depends one above the other arranged flat tubes, louvres and discs, and depends the width as well as depth of the radiator of the dimensions of the components. Thus no more depends but can the number and packing density of the flat tubes on the positions of the receiving openings in a tubesheet of the Wasserkastens, individual selected become. In addition the size of the radiator according to invention the given requirements can become easily by selection of the corresponding components adapted.

The radiator according to invention can do both and cooling agent-cool, when intercoolers, when oil coolers, in mono block execution, when combination-cool become and simple performed in simmer by simmering variants. In addition recesses and openings are in the radiator easily possible. All types of aluminum air lamellas use can find, whereby free choice exists in the lamella-high, if the discs possess the same height. In addition in a single radiator different air lamellas can become inserted. For different performances various block-deep are, z. B. 75 mm, 120 mm or 150 mm of possible. The use of repeat parts the permitted inexpensive structure and the reduction of stock program costs. With a single air lamella combination-cool, z can. B. Air/load air, air/cooling agent radiators with a continuous air lamella manufactured become. Such radiators have substantial advantages with the pollution. In addition the possibility exists to separate air and Wasserkästen due to the different thermal expansions.

Beside the minimization of the number of the base members an advantage consists of the fact that the parts prefabricated to become to be able. In addition requires the finished soldered radiators no reworks.

A development of the radiator according to invention consists of the fact that the flat tubes at at least a front end are sealed. The flat tubes exhibit an opening in the area at least an end in the flat side. Thus the discs cannot become direct on the flat tubes fitted and it require connection means and/or. Sealing members between the discs and the flat tubes. Another possibility plans that the ends of the flat tubes are slid into corresponding slots of the discs. The flat tubes axial

are then flowed against.

An embodiment plans that the flat tubes exhibit turbulence inserts. The flat tubes at its interior and/or outside with solder are platiert. In this way can become material conclusive both the turbulence inserts and the lying close discs and air lamellas with the flat tubes connected.

A development plans that the flat tubes are as multi-chamber pipes or formed as pipepipe pipes. In this way avoided becomes that the flat tubes deform with an high internal pressure.

The length of the flat tubes corresponds according to invention to the sum of the overall length of two discs and the louvres arranged between them. The discs a part severed of an extruded section represent. The production of an extruded section is relative simple and inexpensive. The corresponding discs are sawed off by this extruded section in the desired thickness, whereby the thickness usually corresponds to the height of the louvre.

A specific embodiment plans that the disc is formed as fitting and exhibits a connection channel orthogonal to the opening. Over the opening the single flat tubes with the Mediums which can be cooled become supplied, whereby the Mediums over the connection channel into the fitting initiated and/or. from this one expenditure-leads. A simple version plans against the fact that the introduction and/or. Ausleitung of the Mediums direct over the opening, which can be cooled, made. The radiator is thus also extreme variable regarding its terminals and can lateral and from above and/or. down to be flowed against.

In prefered manner the disc possesses at least the height, which corresponds to the overall height of two louvres with a flat tube or a flat material arranged between them.

Such discs are z. B. also required if the connection channel exhibits a relative large diameter and therefore not in a normal disc to be accommodated is. With discs with larger height usually two discs become summarized, whereby the flat tube rests not against the flat side of the disc separates into a slot orthogonal to the opening is pushed in. The flat tube is front open and the slot is with the opening connected. The flat tube is soldered in this slot fluid tight and thus to the supply channel connected.

With another variant is provided that the disc exhibits two or several, next to each other located openings and two or several flat tubes next to each other are on this disc arranged. Thereby the possibility becomes provided that become concurrent cooled in a single radiator several Mediums, whereby the flat tubes are only connected with one another over the discs. By the fact the possibility exists that each flat tube exhibits own louvres or that the flat tubes are over a common louvre additional connected with one another.

As already mentions, one above the other located flat tubes with different high louvres can and/or. with different dense lamella packings connected with one another its. In this way the performance of the radiator becomes adapted to the requirements. In addition the radiator a partial changing achievement profile can exhibit itself. The different high louvres different high discs are associated.

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Cooler for two or several Mediums which can be cooled so designed can be that liquids and/or gases are cool concurrent.

Furthermore provided can be with an embodiment that the width and/or the depth of the radiator over its height vary. The form of the radiator can become optimum to the local circumstances adapted in this way.

The invention relates to also a method to the production of a radiator, whereby the flat tubes, discs, louvres and if necessary. Fittings first in a cartridge to be kassettiert and subsequent in a charcoal brazier the components to the finished radiator soldered with one another become with one another. After the soldering operation it does not require any remachining at the radiator which to the advantage has that the manufacturing expenditure is reduced on a minimum, and that eventual contamination resulting with a remachining becomes avoided.

Other advantages, features and details of the invention result from the Unteransprüchen as well as the subsequent description, are in detail described in which bottom reference on the drawing several embodiments. In the drawing the represented can be and in the claims as well as in the description mentioned features single in each case for itself or in arbitrary combination invention-essential.

In the drawing show:

Fig. 1 a schematic perspective view of a first embodiment of the radiator according to invention, partly cut open;

Fig. 2 an embodiment of a disc;

Fig. 3 an embodiment of a flat tube, partial broken and aborted;

Fig. 4 a perspective view of an embodiment of a fitting;

Fig. 5 a section V-V in accordance with Fig. 4;

Fig. 6 a section VI-VI in accordance with Fig. 3;

Fig. 7 a section VII VII in accordance with Fig. 3 by the flat tube;

Fig. 8 a side view of an embodiment of a waving rib;

Fig. 9 a perspective view of a second embodiment of the radiator according to invention;

Fig. 10 a perspective view of a third embodiment of the radiator according to invention;

Fig. 11 a perspective view of a fourth embodiment of the radiator according to invention;

Fig. 12 a side view of a fifth embodiment of the radiator according to invention;

Fig. 13 a plan view toward the arrow XIII in accordance with Fig. 12 on the radiator in accordance with the fifth embodiment; and

Fig. 14 a side view toward the arrow IV on the radiator in accordance with Fig. 12.

The Fig. 1 shows a first embodiment one altogether with 1 of referred radiator for stationary and mobile plants. This radiator 1 is flowed through toward the arrows 2 from air. For the sake of simplicity only the structural elements of the radiator are 1 shown in the lower and in the upper region, which extend however over the full height of the radiator 1. The lower and upper conclusion form a flat material 3, at that a louvre 4, and/or. a waving rib 5 as well as against the lateral ends a disc 6 as well as a fitting 7 rest. A flat tube 8 as well as an other waving rib 5 with disc 6 follow. This structure sits down now away up to the other flat material 3. At the lower end is an other fitting 9, with which a connection channel is more visible 10 '.

The Fig. a disc 6, which is a part of an extruded section, shows 2. The disc 6 is sawed off in the desired thickness by the extruded section. To the guide of the Mediums which can be cooled the disc 6 exhibits a central opening 11, which possesses an elongated shape with the represented embodiment. It is however also more conceivable that in place of a single opening 11 the disc 6 is provided with several openings, which lie next to each other.

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The Fig. the end of the flat tube 8, which is likewise with an opening 12 provided, shows 3, which exhibits the form of the opening 11. Into the flat tube 8 a turbulence insert 13 is pushed in, which is more visible partial. Front one is the flat tube 8 over an use 14, which is pushed in front, sealed.

The Fig. the fitting 7 shows 4 and/or. 9, which corresponds to the disc 6 in the cross section. The fitting 7 and/or. 9 exhibits likewise the opening 11, however a larger height possesses. The height corresponds itself the sum of the height of two waving ribs 5 and the height of a flat tube 8, like significant from Fig. 1 results in. Orthogonal to the opening 11 extended itself the connection channel 10, which is with the opening 11 fluid-connected. In addition the fitting 7 points and/or. 9 a lateral slot 15 up, which in Fig. 5 is more discernible. Into this lateral slot 15 an end of a flat tube 8 is pushed in '. This end of the flat tube 8 ' possesses one to the embodiment of the flat tube 8 the Fig. 3 alternative formation and is front open. This flat tube 8 ' thus direct front one flows against.

The Fig. 6 shows a cross section VI-VI by the flat tube 8 in the Fig. 3, whereby the significant opening 12, the turbulence insert 13 as well as the use 14 are more discernible. Both the use 14 and the turbulence insert 13 become by a soldering in the flat tube 8 and/or. the turbulence insert 13 in the flat tube 8 ' fixed. For this the inside of the flat tube is 8 and/or. 8 ' with solder clad. The attachment of the flat tube 8 ' in the fitting 7 and/or. 9 made likewise by a soldering, for which the flat tube is 8 ' clad at its outside with solder.

The Fig. 7 shows the section VII VII by the flat tube 8 in accordance with Fig. 3 and there is the likewise significant use 14 and the turbulence insert 13 more discernible. Over the use 14 the turbulence insert becomes 13 in the flat tube 8 centered and up to soldering held.

The Fig. an embodiment of a waving rib 5, which possesses a trapezoidal shaft, shows 8. It is however also more conceivable that the shaft with rounded ends becomes manufactured. The height of the waving rib 5 corresponds to the height of the disc 6. The attachment of the waving rib 5 and the discs 6 and/or. Fittings 7 and 9 at the flat tubes 8 made likewise over a soldering, for which the flat tube is 8 outside clad with solder.

The Fig. a second embodiment of the radiator according to invention 1 shows 9, with the z. B. Cooling water and

transmission oil cooled to become to be able. To the cooling of the cooling water the radiator 1 exhibits a first area 16 and to the cooling of the transmission oil a second area 17. The cooling water steps z. B. over a port 18 into the fitting 7 and thus into the radiator 1. There the cooling water becomes 8 distributed over the openings 11 into the single flat tubes. The cooling water flows through the flat tubes and becomes 6 collected at the other end over the single discs and steps at the fitting 9, and/or. over an other port 19. It is still noted that is 5 arranged between the two fittings 7 and 9 a waving rib, which exhibits the height of the fittings 7 and 9. Thus no flat tube 8 ' between these two fittings 7 and 9 is.

The oil which can be cooled occurs 17 distributed over the connection channel 10 the fitting 7 of the second area 17 and becomes, like the water which can be cooled, over the openings 11 into the single flat tubes 8 of the second area. After flowing through the flat tubes 8 the cooled oil collected becomes and steps at the connection channel 10 of the fitting 9.

One points out that the flat tubes 8 of the second area 17 with waving ribs 5 are provided ', which extend not only over the flat tubes 8 of the second area but also over the flat tubes 8 of the first area and thus interconnects the next to each other located flat tubes 8 of the two areas 16 and 17. This applies also to the discs 6 '. These discs 6 ' are provided with in each case two openings 11, whereby an opening for the flat tubes 8 of the first area 16 and an opening for the flat tubes 8 of the second area are 17 certain.

It is still noted that it is not necessarily required that the waving ribs of 5 ' over the flat tubes 8 both areas 16 and 17 extend. Also waving ribs used can become, which extend only over the associated flat tubes 8.

The upper and lower conclusion of the radiator 1 made over flat material 3, whereby the lower flat material 3 possesses the depth of the entire radiator 1.

The Fig. an other embodiment of the radiator according to invention 1 shows 10, are 21 provided with which first, upper region 20 and second, bottom portion. First man upper region 20 serves 21 for the cooling of water and possesses a larger width than the lower, second area. The supply of the upper region 20 made over a fitting 7, which exhibits two connection channels 10 and 10 '. With the connection channel 10 the openings 11 of the discs 6 of the first area are 20 connected, 8 distributed over which the water becomes into the flat tubes. The chilled water becomes the fitting 9, in particular its connection channel 10 removed.

The oil which can be cooled occurs 10 ' the fitting 7 over the connection channel. ' The fitting 7 an opening exhibits orthogonal to the connection channel 10, which aligns with the openings of the discs 6 of the second area 21. In this way the oil which can be cooled becomes 21 distributed into the flat tubes 8 of the second area. The cooled oil becomes 9 again removed over the connection channel 10 ' the fitting.

From the Fig. 9 and 10 significant is more discernible that the form of the radiator can become problem-free 1 adapted at predetermined installation dimensions, by longer or shorter flat tubes 8 and waving ribs 5 and possibly. modified fittings 7 used become.

▲ top It is still pointed out that in place of in the Fig. 10 of represented fitting 7 and/or. 9, which with two connection channels 10 and/or. 10 ' and two openings 11 is provided, also two conventional fittings 7 and/or. 9, which become next to each other set, used to become to be able.

The Fig. an other embodiment of the radiator according to invention shows 11, with which three Mediums, waters, air and oil cooled to become i.e. to be able. The entry of the water made over an opening 22 in the upper flat material 3, whereby this opening 22 with the opening 11 of the underlying discs 6 aligns. In this way in the area 23 the flat tubes finding become 8 supplied with the water which can be cooled. The removal of the chilled water made over an opening 24, which is likewise in the flat material 3 provided.

The second Mediums, i.e. air, occur at the connection channel 10 of the fitting 7. The exit of the cooled air made over the connection channel 10 ' at the fitting 9. Between the fitting 7 and the fitting 9 is a separating element, so that the air which can be cooled not direct over the single openings 11 and 12 of the fitting 7 into the fitting 9 transfers knows, but the respective flat tubes 8 to flow through must. This separating element can be in form of a disc 6 ', which does not exhibit opening in the area 25, or in form of a flat material, which locks the opening of a disc 6, realized.

The third Mediums, like z. B. oil which can be cooled, occurs 10 the fitting 7 in the area 26 over a connection channel and leaves this area 26 over the connection channel 10 ' of the fitting 9. Between the two fittings 7 and 9 is a flat material.

The Fig. an other embodiment of the radiator 1 shows 12 in side view, whereby significant mounting holes are more discernible 28, which are in some discs 6 provided. In addition a cap 29 more discernible at a filler neck 30 is, which coaxial lies to the openings 11. The fitting 7 is provided with the port 18 and the fitting 9 with the port 19. Direct below the fitting 7 is a disc 6 ', which does not exhibit opening. A such disc 6 ' is also below the fitting 9 and on same plane on the opposite side of the radiator 1. In this way the radiator becomes 1 into an upper region the cooling of water and into a bottom portion the cooling of transmission oil divided. The hot transmission oil leaks out over the connection channel 10 into the fitting 7 and over the connection channel 10 ' the fitting 9. A separation made here likewise over a disc 6 ' without opening.

The Fig. a plan view shows 13 to the radiator 1 in accordance with Fig. 12, whereby the significant cap 29 and the port 18 as well as the opening 11 are more discernible. The port 18 changes 31 into an oval cross section 32 from a circular cross section.

The Fig. the radiator 1 the Fig shows 14. 12 in the side view, whereby the significant discs are more discernible 6 ' without opening. The flat tubes 8 ' flow, like initially described, central into a slot of the fittings 7 and 9.

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1. Cooler (1) with modular build upable cool construction units, like cooling agent pipes, between which cooling agent pipes arranged louvres (4) and the cooling agent pipes at their ends are interconnecting with one another elements, characterised in that the cooling agent pipes as flat tubes (8, 8 ') formed, and that those are the flat tubes (8, 8 ') of interconnecting with one another elements as discs (6, 6 ') formed, which at least the height of a louvre (4) it exhibits and on the flat tubes (8, 8 ') finallaterally mounts, whereby the discs (6, 6 ') exhibit an opening (11) and over the opening (11) with the interior the flat tubes (8, 8 ') connected are.

2. Cool according to claim 1, characterised in that the flat tubes (8, 8 ') at at least a front end sealed are.

3. Cool ones after one of the preceding claims, characterised in that the flat tubes (8, 8 ') in the area at least an end with an opening (12) by the flat side are provided.

4. Cool ones after one of the preceding claims, characterised in that the flat tubes (8, 8 ') turbulence inserts (13) exhibit.

5. Cool ones after one of the preceding claims, characterised in that the flat tubes (8, 8 ') at its interior and/or outside with solder clad are.

6. Cool ones after one of the preceding claims, characterised in that the flat tubes (8, 8 ') as multi-chamber pipes or as Sickenrrohre formed are.

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7. Cool one after one of the preceding claims, characterised in that the length of the flat tubes (8, 8 ') of the sum of the overall length of two discs (6, 6 ') and the louvres (4), arranged between them, is.

8. Cool ones after one of the preceding claims, characterised in that the discs (6, 6 ') a part severed of an extruded section represent.

9. After one of the preceding claims, characterised in that the disc (6, 6 ') as fitting (7, 9) formed is cooler and one to the opening (11) orthogonal connection channel (10, 10 ') exhibits.

10. Cool one after one of the preceding claims, characterised in that the disc (6, 6 ') at least the overall height of two louvres (4) also between them arranged flat tube (8, 8 ') or flat material (3) exhibits.

11. Cool according to claim 11, characterised in that the disc (6, 6 ') one to the opening (11) orthogonal receiving slot (15) for the flat tube (8, 8 ') or a flat material (3) exhibits.

12. Cool ones after one of the preceding claims, characterised in that the flat tubes (8, 8 ') front over uses (14) or by a flaring sealed are.

13. Cool ones after one of the preceding claims, characterised in that on a disc (6, 6 ') of two or several flat tubes (8, 8 ') next to each other arranged are and the disc (6, 6 ') of two or several openings (11) exhibit.

14. Cool ones after one of the preceding claims, characterised in that the two or several next to each other arranged flat tubes (8, 8 ') over a louvre (4) connected with one another are.

15. Cool ones after one of the preceding claims, characterised in that at least two louvres (4) different heights exhibit.

16. Cool ones after one of the preceding claims, characterised in that of two or more different fluids are cool.

17. Cool ones after one of the preceding claims, characterised in that liquids and/or gases are cool.

18. Cool one after one of the preceding claims, characterised in that the width and/or the height of the radiator (1) over its height of varied.

19. If necessary methods to the production of a radiator after one of the preceding claims, characterised in that the flat tubes (8, 8 '), discs (6, 6 '), louvres (4) and fittings (7, 9) in a cartridge to be kassettiert and subsequent in a charcoal brazier the components to the finished radiator (1) soldered with one another become with one another.

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